Time of Arrival Algorithm: ewtoa

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Description

The algorithm attempts to identify an initial region of stationary noise, and uses the maximum value within that region to construct a detection threshold.

Mathematical Principles

See *Usage*.

Physical and Engineering Principles

See *Usage*.

Usage

The algorithm has three critical parameters (W_0, α, and β), the roles of which are explained in the following algorithm outline:

1. Set the window length W to the initial window length W_0. Compute the signal standard deviation within this window. Iteratively double W and recompute the standard deviation until the standard deviation increases by more than a factor of α from one window size to the next. When this increase is detected, halve the window length W to obtain a window with (approximately) constant standard deviation.

2. Subtract the mean of the signal within the window of length W from the entire signal.

3. Construct a threshold as factor β multiplied by the maximum of the absolute value of the median filtered window of length W.

4. The TOA index is the first sample for which the absolute value of the median filtered signal exceeds the threshold.